CLAIMS

1. An apparatus for implanting ions in an aluminum alloy part (5), comprising a source (6), delivering ions accelerated by an extraction voltage, and first adjusting means (7-11) for adjusting an initial beam (f1') of ions emitted by said source (6) into an implantation beam (f1), characterized in that said source (6) is an electron cyclotron source producing multi-energy ions that are implanted in the part (5) at a temperature below 120°C, the implantation of the multi-energy ions from the implantation beam (f1) being effected simultaneously at a depth controlled by the extraction voltage of the source.

2. The apparatus as in claim 1, characterized in that it further comprises second adjusting means (1, 4, 12) for adjusting the relative positions of the part (5) and the ion source (6).

3. The apparatus as in claim 2, characterized in that the second adjusting means (1, 4, 12) comprise a part holder that is movable (12) so as to displace the part (5) during its treatment.

4. The apparatus as in claim 3, characterized in that the part holder (12) is equipped with cooling means (13) to evacuate the heat generated in the part (5) during the implantation of the multi-energy ions.

5. The apparatus as in any one of the preceding claims, characterized in that the first adjusting means (7-11) for adjusting the ion beam comprise a mass spectrometer (7) for sorting the ions produced by the source (6) according to their charge and mass.

6. The apparatus as in any one of the preceding claims, characterized in that the adjusting means (7-11) for adjusting the initial ion beam (f1') further comprise optical focusing means (8), a profiler (9), a current transformer (10) and a shutter (11).

7. The apparatus as in any one of the preceding claims, characterized in that it is confined in an enclosure (3) equipped with a vacuum pump (2).

8. The apparatus as in claim 3, characterized in that the second adjusting means (1, 4, 12) for adjusting the relative positions of the part (5) and the ion source (6) comprise calculating means (1) for calculating said position on the basis of data related to the nature of the ion beam, the geometry of the part (5), the rate of displacement of the part holder (12) with respect to the source (6), and the number of passes already completed.

9. A process for treating an aluminum alloy by ion implantation employing an apparatus as in any one of the preceding claims, characterized in that the multi-energy ion beam displaces relatively with respect to the part (5) at a constant rate.

10. A process for treating an aluminum alloy by ion implantation employing an apparatus as in any one of claims 1 to 8, characterized in that the multi-energy ion beam displaces relatively with respect to the part (5) at a variable rate that takes into account the angle of incidence of the multi-energy ion beam with respect to the surface of the part (5).

11. The treatment process as in either of claims 9 and 10, characterized in that the multi-energy ion beam is emitted at a constant emission rate and constant emission energies.

12. The treatment process as in either of claims 9 and 10, characterized in that the multi-energy ion beam is emitted at a variable emission rate and variable emission energies controlled by the ion source (6).